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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/536,000 03/27/00 BAILEY

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EXAMINER

ALEJANDRO MULERO, L

ART UNIT

PAPER NUMBER

1763

DATE MAILED:

10/03/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/536,000

Applicant(s)

BAILEY ET AL.

Examiner

Luz L. Alejandro

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 July 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 and 28-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14, 18 and 28-36 is/are rejected.
- 7) ☒ Claim(s) 15-17 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-4, 6-9, 12-13 and 28-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dandl, U.S. Patent 5,707,452 in view of Tan et al., U.S. Patent 5,795,451.

Dandl shows the invention as claimed including a plasma processing apparatus for processing a substrate 80 comprising: a wall 78 defining part of the process chamber within which a device 54 is used for igniting and sustaining within the process chamber a plasma for the processing; and a magnetic array having a plurality of magnetic elements 14, 30, 32, 34 and 88, that are disposed within the periphery of the chamber, the plurality of elements being configured to produce a magnetic field establishing a plurality of cusp patterns on the wall (see fig. 2 and its description).

Dandl does not expressly disclose that the apparatus comprises a device for changing the cusp pattern. Tan et al. discloses a device for rotating magnetic elements, such as permanent magnets, so they can be rotated to shift the magnetic field over time in order for a more uniform processing of the substrate, therefore improving the substrate being processed (see col. 1, lines 43-52; and col. 3, lines 9-15). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention

was made to modify the apparatus disclosed by the Dandl reference as to further comprise a device to rotate the magnetic elements in order to shift the magnetic field over time for optimizing the substrate being processed and the process being performed in the apparatus by reducing the damage of the substrate due to a more uniform processing of the substrate.

Dandl is applied as above but does not expressly disclose that the substrate support is a chuck, but the examiner takes official notice that such means is well known and used in the art for securely supporting and holding substrates in the processing chamber, and its inclusion in the apparatus disclosed by the Dandl reference would be prima facie obvious.

Dandl further discloses that the magnetic field has an azimuthally symmetric radial gradient, wherein the magnetic elements are permanent magnets; wherein the magnetic elements are axially oriented about the periphery of the process chamber; the plurality of magnetic elements create a stronger magnetic field, of 875 Gauss, at the wall and a weaker magnetic field above the substrate.

With respect to claims 6-7, such limitations are directed to a method limitation which are viewed as intended uses and do not further limit, therefore do not patentably distinguish the claimed invention. Note that the device for rotating the magnetic elements can be configured to perform the claimed limitations.

Claims 5, 10-11, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dandl, U.S. Patent 5,707,452 in view of Tan et al., U.S. Patent 5,795,541, as

Art Unit: 1763

applied to claims 1-4, 6-9, 12-13 and 28-36 above, and further in view of Shan et al., U.S. Patent 6,113,731.

Dandl and Tan et al. do not expressly disclose that the magnetic elements are electromagnets. Shan et al. discloses the use of electromagnets for generating an electronically rotated magnetic field in order to reduce damage of the substrate being processed and increase radial uniformity of the plasma process being performed on the substrate (see col. 4, lines 45-58; col. 5, lines 1-5; col. 6, lines 51-65; and col. 11-line 65 to col. 12-line 44). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus disclosed by Dandl and Tan et al. as to comprise electromagnets as the magnetic elements and as to rotate them to shift the magnetic field over time as to optimize the process being performed in the apparatus by reducing the damage of the substrate being processed and increasing radial uniformity of the plasma process being performed on the substrate. Note that the magnetic elements can be rotated in an alternating pattern or in a same direction.

Moreover, note that Shan et al. further disclosed that the electromagnets can be replaced by permanent magnets (see col. 9, lines 50-67, and col. 11-line 65 to col. 12-line 16). Therefore, it would have been obvious to one skilled in the art at the time the invention was made to use electromagnets in the apparatus of Dandl and Tan et al. because there is not evidence that the choice of a particular magnetic element would significantly affect the overall performance of the plasma processing apparatus.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dandl, U.S. Patent 5,707,452 in view of Tan et al., U.S. Patent 5,795,541, as applied to claims 1-4, 6-9, 12-13 and 28-36 above, and further in view of Setoyama et al., U.S. Patent 6,196,155 B1.

Dandl and Tan et al. do not expressly disclose that the device for moving the magnetic array comprises a device for moving the array closer and farther away from the chamber. Setoyama et al. disclose an apparatus in which the magnetic array is move farther away and closer to the chamber by a device 14 or 15, in order to change the magnetic field strength (see figs. 1-2 and their descriptions). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Dandl and Tan et al. as to comprise a device for moving the magnet array closer and farther away from the chamber, in order to change (adjust) the magnetic field strength.

Claims 1-4, 6-9, 12-14 and 28-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Setoyama et al., U.S. Patent 6,196,155.

Setoyama et al. shows the invention as claimed including a plasma processing apparatus for processing a substrate 4 comprising: a wall defining part of the process chamber within which a microwave device is used for igniting and sustaining within the process chamber a plasma for the processing; a magnetic array having a plurality of magnetic elements 20a and 20b, that are disposed within the periphery of the chamber, the plurality of elements being configured to produce a magnetic field establishing a

plurality of cusp patterns on the wall; and devices 14 and 15, for rotating the magnetic elements as to change the cusp pattern of the magnetic field, and which can move the magnetic array closer and farther away from the chamber (see figs. 1-2 and their descriptions).

Setoyama et al. is applied as above but does not expressly disclose that the substrate support is a chuck, but the examiner takes official that such means is well known and used in the art for securely supporting and holding substrates in the processing chamber, and its inclusion in the apparatus disclosed by the Setoyama et al. reference would be prima facie obvious. Also, Setoyama et al. does not expressly disclose that the devices 14 and 15 are connected between the plurality of magnetic elements and the process chamber, but there is no evidence that such device arrangement would affect the overall performance of the apparatus.

Setoyama et al. further discloses that the magnetic elements are permanent magnets which are axially oriented about the periphery of the process chamber. Also, it is inherent from fig. 1 that the plurality of magnetic elements create a stronger magnetic field at the wall and a weaker magnetic field above the substrate, and that the magnetic field has an azimuthally symmetric radial gradient.

With respect to claim 32, Setoyama et al. does not expressly disclose that the magnetic field at the wall is between about 15 to 1500 Gauss. Regarding this processing parameter, and as stated above, Setoyama et al. discloses that the magnetic field strength can be changed by using the devices 14 and 15. Therefore, in view of this disclosure, it would have been obvious to one having ordinary skill in the art

at the time the invention was made to optimize the magnetic field based on the process being performed through routine experimentation.

With respect to claims 6-7, such limitations are directed to a method limitation which are view as intended uses and do not further limit, therefore do not patentably distinguish the claimed invention. Note that the device for rotating the magnetic elements can be configured to perform the claimed limitations.

Claims 5, 10-11, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Setoyama et al., U.S. Patent 6,196, 155, as applied to claims 1-4, 6-9, 12-14 and 28-36 above, and further in view of Shan et al., U.S. Patent 6,113,731.

Setoyama et al. does not expressly disclose that the magnetic elements are electromagnets. Shan et al. discloses the use of electromagnets for generating an electronically rotated magnetic field in order to reduce damage of the substrate being processed and increase radial uniformity of the plasma process being performed on the substrate (see col. 4, lines 45-58; col. 5, lines 1-5; col. 6, lines 51-65; and col. 11-line 65 to col. 12-line 44). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus disclosed by Setoyama et al., as to comprise electromagnets as the magnetic elements and as to rotate them to shift the magnetic field over time as to optimize the process being performed in the apparatus by reducing the damage of the substrate being processed and increasing radial uniformity of the plasma process being performed on the

substrate. Note that the magnetic elements can be rotated in an alternating pattern or in a same direction.

Moreover, note that Shan et al. further disclosed that the electromagnets can be replaced by permanent magnets (see col. 9, lines 50-67, and col. 11-line 65 to col. 12-line 16). Therefore, it would have been obvious to one skilled in the art at the time the invention was made to use electromagnets in the apparatus of Setoyama et al. because there is not evidence that the choice of a particular magnetic element would significantly affect the overall performance of the plasma processing apparatus.

Allowable Subject Matter

Claims 15-17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luz L. Alejandro whose telephone number is 703-305-4545. The examiner can normally be reached on 5/4/9.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory L. Mills can be reached on 703-308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-3599 for regular communications and 703-305-3599 for After Final communications.

Art Unit: 1763

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.


LLAM

October 1, 2001October 1, 2001


GREGORY MILLS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700